Chapter

The Pelvic Health Physical Therapy and the Prostatectomy

Mauro Luis Barbosa Junior, Ericka Kirsthine Valentin and Karoline Camargo Bragante

Abstract

Considering prostate adenocarcinoma, the cancer of higher incidence in men, having as treatment of choice the prostatectomy, and the high prevalence of urinary incontinence (UI) and erectile dysfunction (ED) after the surgery, the physiotherapy becomes an eligible treatment for such alterations. The rehabilitation of post-prostatectomy effort urinary incontinence is considered a recommendation grade B. Erectile dysfunction has as its first line of treatment penile vacuum therapy. Pelvic health physical therapy has as its main tool the rehabilitation of the pelvic floor muscles (PFM), which can be assisted by biofeedback and electrotherapy. The training of these muscles accelerates the recovery process of post-prostatectomy stress urinary incontinence and has greater therapeutic relevance when the physiotherapeutic treatment is initiated in the pre-surgical period. Post-micturition dribble is also treated by training the pelvic floor muscles. Urinary urgency, associated or not with incontinence, can be treated with electrotherapy, which is considered second or third line of treatment. Erectile rehabilitation has two physical resources of treatment, physical therapy, one through the vacuum and the other of the shock wave. Both penile vacuum therapy and shock wave therapy are considered the first line of treatment in the approach to erectile dysfunction.

Keywords: physical therapy, erectile dysfunction, urinary incontinence, prostate cancer, prostatectomy

1. Pelvic health physiotherapy

Pelvic health physiotherapy has as its main therapeutic pillar the rehabilitation of the pelvic floor muscles (PFM). Since the work done by the gynecologist Arnold Kegel in the 1940s, the treatment of the pelvic floor has been evolving and being recognized by the scientific community. Kegel began his work in this area by creating exercises for PFM for the treatment of female urinary incontinence. When assumed by physical therapy, the exercises became perineal kinesiotherapy, currently having a gold standard of recommendation grade A, in the rehabilitation of female urinary stress incontinence (SUI).

With evolution, the "Kegel exercises" also reached male pelvic health. However, because the anatomy and pathophysiology of urinary incontinence (UI) in men are distinct from women, which also influences the lower prevalence of SUI in the male population, around 10%, the effectiveness of the treatment may be variable, when compared to the woman's. The detrusor hyperactivity associated with

urinary urgency with or without loss of urine is commonly associated with prostatic disease, needing to be investigated, with the pelvic floor having little influence on male urinary incontinence.

2. Rehabilitation of urinary continence after prostatectomy

The prostatectomized patient has transient SUI, and maintenance of this condition may still prevail in 8% of patients, 2 years after surgery. The prevalence that precedes this period is variable, since it depends on the definition of incontinence, severity, degree of discomfort, and methodology for evaluating the magnitude. The evolution of surgical techniques, with regard to the greater or less prevalence of post-prostatectomy UI, has still been the subject of debate [1].

When talking about robot-assisted laparoscopic prostatectomy, the prevalence of incontinence can be influenced by the patient's preoperative characteristics, surgeon's experience, surgical technique, and methods used to collect and present data. The characteristics of patients that may influence postsurgical continence are age, body mass index, comorbidity, presence of lower urinary tract symptoms, and prostate volume [2].

The damage generated during the surgical procedure can occur in the urethral sphincter complex, in the supporting structures, or in its innervations, leading to the high prevalence of UI, being the anatomical support and pelvic innervation, important etiological factors of the loss of the continence post-prostatectomy. Excessive dissection during surgery, neurovascular bundle injury, and postoperative fibrosis also contribute negatively to the maintenance of continence. On the other hand, the maintenance of the bladder neck and fixation of the bladder-urethral anastomosis, before and after, are favorable for continence [3].

Prostate removal surgery favors stress urinary incontinence and urgency. The urgency, associated or not with incontinence, is also present in the detrusor overactivity not infrequently found in patients, making it more prevalent, since they add to the age factors, which reduces bladder complacence and prostatic enlargement, which leads to emptying dysfunction, obstructive [4].

Post-micturition dribble may also be present post-prostatectomy. There is usually no bladder alteration, but rather the inability of PFM, the bulbospongiosus muscle in particular, to eject the urinary volume contained in the ureter after the end of urination [5].

2.1 Physiotherapeutic treatment of urinary incontinence after prostatectomy

The prostatectomized patient has a great impact on their quality of social life and often with important limitations in their physical activities and daily life due to loss of urine. Considering the social and pathophysiological aspects of post-prostatectomy urinary incontinence (PPUI), physical therapy for male pelvic health has been offering therapeutic strategies through perineal kinesiotherapy, biofeedback, electrostimulation, behavioral therapies, and lifestyle changes [6].

2.2 Functional assessment of the pelvic floor

Perineal kinesiotherapy, also known as pelvic floor muscle training (PFMT), is performed after a careful functional assessment of the PFM where the muscular capacity of resistance and strength, symmetry, tone, and presence of pain are observed. This evaluation is not yet standardized for the male pelvic floor, and most of the protocols used to evaluate the female PFM are used, such as the modified

Oxford scale, for example, which has a bidigital touch reference in the vagina and with the patient evaluated in supine. The Ortiz scale (**Table 1**) does not assume patient positioning and does not mention the female anatomy, being quite reasonable for the evaluation of the pelvic floor of the man.

In the inspection of the male pelvic floor, we observe the retraction of the anus and elevation of the penis, which is presented subtly. Dynamic palpation is one of the few methods, if not the only one at present, for the assessment of the pelvic floor of both sexes. The anorectal touch is necessary for the evaluation of the pubococcygeus muscle, assessing its contractile capacity bilaterally, strength, and endurance. Palpation of the perineal body can also assess muscle activity and tone [8].

The pad test can be a useful tool to quantify urinary loss. It can be 24 or 1 hour. However, there is evidence that the 24 hour pad test is statistically more relevant for PPUI assessment. The accomplishment of this one becomes important, since some authors have it like a criterion of discharge of the treatment or cure of the incontinence. It can enter such criteria from the use of a pad by day to none [9].

The voiding diary is a semi-objective method to quantify symptoms such as urinary frequency and incontinence and degree of urgency, use of absorbents, and fluid intake. Urinary volume may contribute to the diagnosis of overactive bladder (OAB) and polyuria. The diary can be carried out for 3–7 days. Although it is a level of evidence 3 and recommendation grade D, it is recommended for the evaluation and measurement of the symptoms and discomforts of urinary incontinence, both at the beginning of treatment and to assess the impact of therapy [10].

The questionnaires, as well as the scales and index, also serve to measure some factors related to urinary incontinence, such as the severity of symptoms and quality of life. Some are more generic like Medical Outcomes Study SF-36 Health Status Profile, and others bring more specific conditions like the King's Health Questionnaire [3].

Although physical therapy is part of the pull first-line treatment offers, the urodynamic examination, requested in the failure of these primary resources, offers a functional evaluation of the lower urinary tract. There is limited evidence that the preliminary urodynamic examination influences the results of the treatment for male urinary incontinence, although it is able to distinguish the different causes of incontinence [11].

After the evaluation and a kinetic-functional diagnosis of the pelvic floor, as well as a functional diagnosis of the lower urinary tract, a therapeutic program can be developed. For pelvic health physiotherapy, the rehabilitation of urinary incontinence consists of behavioral and physical therapies, such as bladder training (BT) and the therapeutic exercises of the pelvic floor muscles, respectively.

Functional assessment of pelvic floor	
0	No objective perineal function, even to palpation
1	Objective perineal function absent, detectable only by palpation
2	Weak objective perineal function, detectable by palpation
3	Objective perineal function, without resistance to palpation
4	Objective perineal function and resistance not maintained by palpation
5	Objective perineal function and resistance by palpation maintained for more than 5 seconds

Table 1.
Functional assessment of pelvic floor by [7].

2.3 Physiotherapeutic resources

In bladder training, the patient is instructed on bladder function and fluid intake, including bowel habits and restriction of caffeine use, for example. Patients with independent urination may be advised of micturition habit and time. In the case of urgency and nocturnal incontinence, BT is as effective as oxybutynin, tolterodine, and solifenacin. It may also promote some improvement in frequency and nocturia when associated with other pharmacological therapies [6].

The PFMT increases urethral closure pressure and stabilizes the urethra. It can be performed with the aid of biofeedback which can be pressure, electromyography, and manual. Visual, auditory, or tactile resources are used to guide the patient in performing the contraction and relaxation of the pelvic floor musculature. Electrotherapy may be another alternative associated with PFMT. Both resources are not superior to PFMT, but when used as a combination therapy, it can favor the evolution of the condition, improving the performance and coordination of the PFM [12].

The PFMT should be offered as first-line therapy [10]. The therapeutic exercises are proposed after a thorough evaluation of the PFM, where the effective time and the repetition of the contraction, without reaching the fatigue, are determined. From there an exercise program is developed, aiming at endurance, strength, coordination, and pre-contraction of muscles.

It should be noted that during PFMT, the patient does not use accessory muscles, such as the abdominals, buttocks, and thigh adductors. The inadequate use of these muscles leads to poor perception of the effective performance of the PFM. The physiotherapist needs to guide the patient on how to perform the most effective contraction without using the accessory muscles. Although the abdominal muscles are considered accessory, the transverse abdominis muscle in particular has a synergistic function to the pelvic floor [13].

The transverse abdomen muscle and the PFM are considered postural muscles, with the support function, that is, they have predominance of tonic muscle fibers and are responsible for the maintenance of orthostatism. Performing a therapeutic exercise program for these synergistic muscles is critical to the functionality and daily life activities of the patient. These muscles activated together favor the dissipation of abdominal load, which would lead to increased intra-abdominal pressure and consequently loss of urine to the effort [14].

Biofeedback for pelvic floor rehabilitation is used to gain a greater awareness of the functions of the PFM, mainly using instruments that provide information about the activity of these muscles. Intracavitary (anal) pressure probes can be used, measuring the contraction in millimeters of mercury or electromyographic that detects the potential of muscular action in microvolt, the latter being also possible through a perineal surface electrode. Its purpose is to better muscle functionality, providing greater proprioception, consequently greater effectiveness in the coordination, strength, and endurance of the PFM [15].

Functional electral stimulation (FES) is a biphasic current transmitted from transcutaneous (**Figure 1**) or intracavitary (**Figure 2**) electrodes. The intensity of the current is given according to the patient's sensitivity, without generating any discomfort or pain [16].

Usually the contractions generated by the electric current assist the voluntary activation of the PFM. Because it is a muscle with a predominance of tonic fibers, the frequency (in hertz) used is low and the pulse width (in microseconds) higher, for example, 20 Hz and 700 μs. The contraction time is variable, on average over 4 seconds, but given individually according to the PFM functional evaluation. The resting time may be one to two times the contraction time.

Figure 1.
Transcutaneous electrodes.

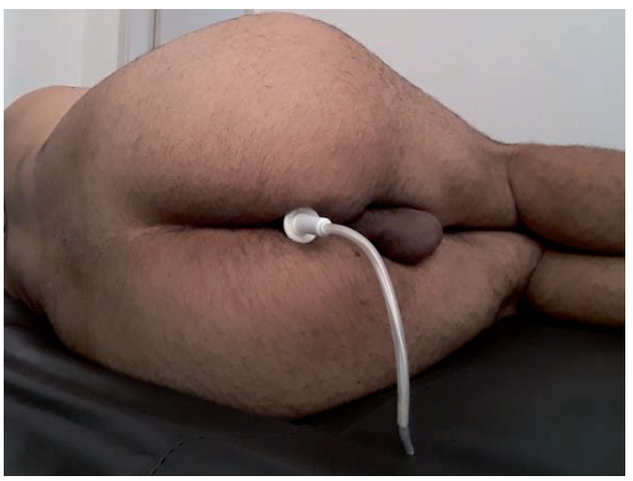

Figure 2.
Intracavitary electrode.

It is not uncommon for patients who have undergone prostatectomy to also have urinary urgency, associated or not with incontinence. Sometimes the urgency is related to a detrusor overactivity, and complaints of nocturia and polaciuria are present. OAB may already manifest even before prostate withdrawal surgery. Changes in the bladder wall, as well as the increase in prostatic volume related to age (elderly), may be related to OAB [17].

In the cases of post-prostatectomy patients who present OAB, the electral therapy with (neuro) modulation objective should be used. A different action in PFM, the electral therapy used in this case is transcutaneous electrical nerve stimulation (TENS). Surface electrodes may be used in the parasacral (**Figure 3**) or tibial (**Figure 4**) regions. The frequency usually used varies between 5 and 10 Hz and the pulse width between 300 and 700 μs; the intensity is given before reaching the motor point, remaining at sensitive levels. The treatment should be performed under physiotherapeutic assistance, with prescription of the home and/or outpatient electrotherapy device. The treatment time is around 12 weeks [15].

In addition to electrotherapy, BT is also indicated. In the case of urinary urgency, it may also be performed through contraction of PFM and inhibition of voiding reflex, allowing the patient to lose the urge to urinate and being able to reach the bathroom more comfortably or delaying urination, in the case of polaciuria.

Post-micturition dribbling may also be another complaint in prostatectomized patients. This situation does not influence the function, or dysfunction, of the bladder. It occurs due to the inability of the bulbospongiosus muscle to eliminate

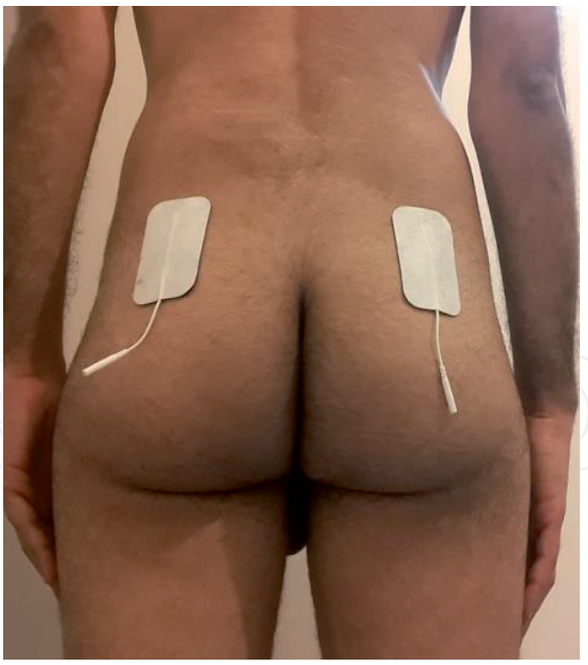

Figure 3.
Parasacral electrodes.

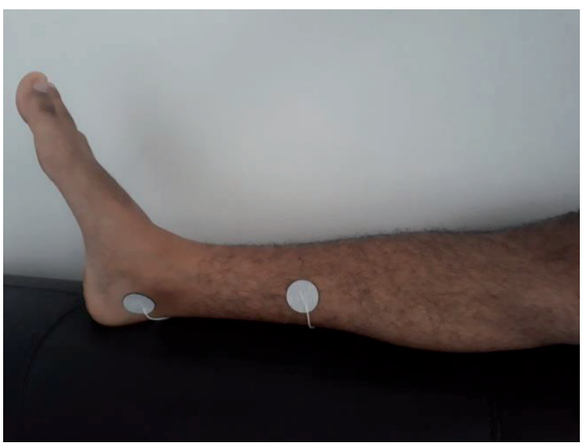

Figure 4.
Transcutaneous tibial nerve stimulation.

the voiding residue present in the bulbar urethra. The treatment consists of the therapeutic exercises of this musculature, aiming to acquire greater muscular force for the expulsion of the urine of the urethra, after the urination. The urethral milking maneuver and bulbar massage may also be associated, but the effectiveness of bulbospongiosus muscle contraction is greater [5].

The loss of urine during orgasm, climacturia, is not uncommon in these patients. The inevitable surgical damages generated in the bladder neck, as well as the event in the sympathetic fibers, responsible for contraction of the bladder neck and relaxation of the external sphincter during the ejaculation expulsion phase, are one of the suggested mechanisms for climacturia [18]. And the proposed physiotherapeutic treatment is PFMT.

3. Rehabilitation of erectile function after prostatectomy

Climacturia, an orgasmic dysfunction, is one of the affected aspects of the sexual quality of life of prostatectomized patients. Before it manifests, it has erectile

dysfunction (ED), highly prevalent in the second postoperative month, reaching around 90%. Complaints about the quality of erection remain frequent even after 12 months postoperatively in around 75% of patients. At the same time, the prevalence of orgasm difficulty was 45% (**Table 2**) [19].

When talking about the post-prostatectomy sexual quality of life, before the complaint of climacturia, which may be presumed that there is penetration, the patient usually presents with a severe erectile dysfunction. The impact on sexual life may be even greater when ED is associated with urinary loss, requiring a much more integral approach to the case, since the patient begins to have an affective distancing from the partner and consequently sexual avoidance. The sexual behavioral approach (**Figure 5**) is necessary in order to keep the patient stimulated sexually, within its limitations. This is the beginning of sexual rehab [20].

Once the behavioral framework is handled, the erectile rehabilitation comes to the scene. Because it is a multifactor ED, which begins with neuropraxia of the cavernous nerve, which promotes pro-apoptotic and pro-fibrotic factors in the penile tissue, thus evolving into a veno-occlusive dysfunction, resources that act in these frames are taken into account for the treatment [21].

Penile vacuum therapy (**Figure 6**) is a physical rehabilitation resource, therefore a physiotherapy, which aims to promote, through a negative pressure, daily erections with the protective function of the erectile tissue, in the same way that nocturnal erections did that no longer occur [22].

By getting into the place of nocturnal erections, which were daily, penile vacuotherapy also needs to be performed daily. In the Engel [22] and Raina and collaborators [23] studies, the mean time of application of the therapeutic vacuum is 10 minutes. However it is known that in 5 minutes of use, the arterial blood is equivalent to the venous one, becoming poor in oxygen. It is also known that a rest of 30–60 seconds in the vacuum normalizes penile oxygenation, suggesting that the application should be done intermittently, with rest between one application and another. The therapeutic pressure is between −150 and −200 mmHg [24]. The treatment time is over 6 months.

Due to the safety of the patient, the prescription and orientation of use should be made by a professional qualified to do so, thus avoiding possible intercurrences during the application, such as penile pain, edema, and hematoma. The patient is taught to perform the penile vacuotherapy, recognizing the perceptions and sensations, regarding the sensitivity, size, and color of the penis, being performed by the physiotherapist in the office, in order to make home treatment safe.

Sound therapy has been used in the treatment of ED. The main treatment currently offered is extracorporeal shock wave therapy. But it is common to the treatment by sound waves; this includes the therapeutic ultrasound, to cause mechanical stress and microtrauma in the place of its application. This vascular stress and microtrauma, which generates a shear stress, induce a cascade of biological

Sexual function	2 Mo	6 Mo	12 Mo
Poor erections	88%	80%	67%
Difficulty with orgasm	62%	51%	45%
Erections not firm	90%	84%	75%
Erections not reliable	83%	75%	60%
Poor sexual function	83%	74%	61%
Overall sexuality problem	59%	59%	50%

Table 2.
Post-prostatectomy sexual disorders.

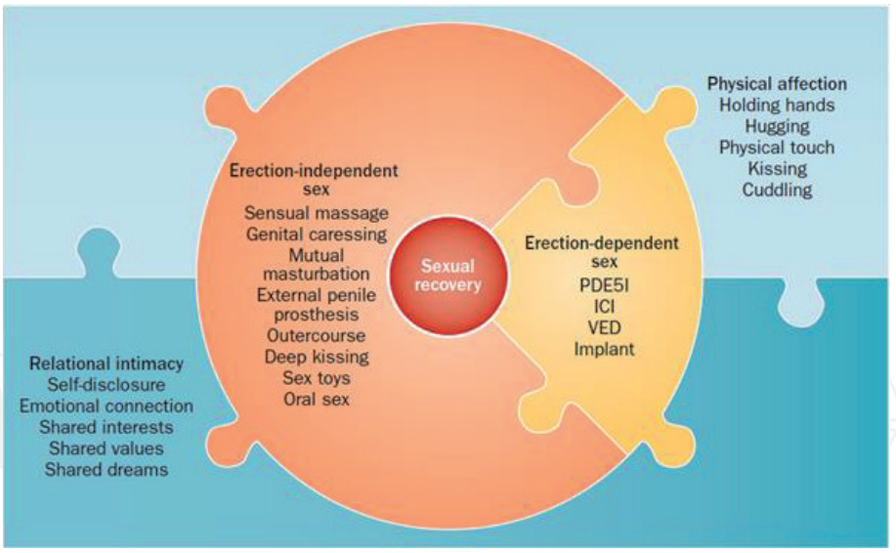

Figure 5.
ICI, intracavernosal injection; VED, vacuum erection device.

Figure 6.
Vacuum erection device.

reactions that result in the release of angiogenic factors which in turn triggers tissue neovascularization with subsequent improvement of blood supply [25].

Penile electrical stimulation (**Figure 7**) has also been studied for penile rehabilitation. Its action consists in the endothelial action. The current generates release of endothelium-dependent nitric oxide, leading to increased blood supply and vasodilation. Favoring the action of endothelial progenitor cells, which secrete pro-angiogenic factors, induces neovascularization, repair, and endothelial function. Endothelial progenitor cells release vascular endothelial growth factor, acting as a mediator of angiogenesis [26].

The erectile latency of the post-prostatectomy patient is variable in duration, and we already know the possible damage to penile erectile tissue. But from the perspective of the striated muscles, it is known that the penis muscles who have a veno-occlusive function, the ischiocavernosus and bulbospongiosus muscles (**Figure 8**), which, besides being in the process of sarcopenia inherent to the senility of the patient, may also pass through atrophy due to disuse.

Figure 7.
Penile electrodes placement.

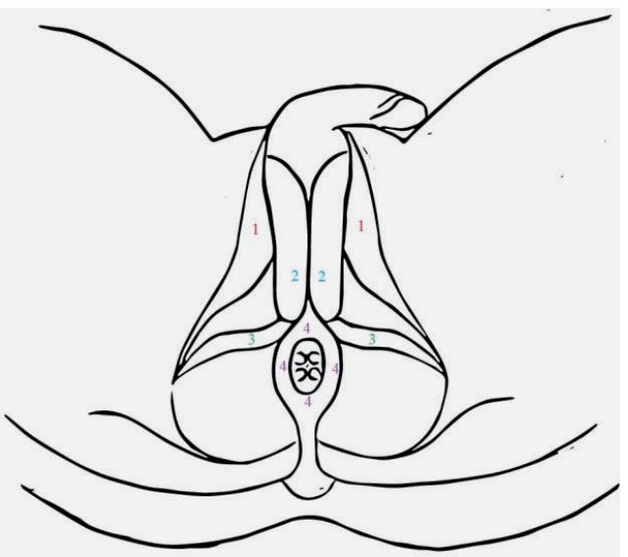

Figure 8.
Perineal muscles ((1) ischiocavernosus muscles, (2) bulbocavernosus muscle, (3) transverse perineal muscle, (4) external anal sphincter muscle).

PFMT, focusing on the penile muscles, acts on the veno-occlusion favoring penile stiffness. However, the ischiocavernosus muscle in particular does not have great relevance in the penile intumescence phase. This suggests that to activate them in a functional PFMT, the penis would need to be at least in its maximum turgidity, considering that this patient has great impairment of the postsurgical erectile function [27].

4. Conclusion

Several studies show the predictive factors for the evolution of both urinary incontinence and erectile dysfunction and that to date no conservative treatment has curative action in both situations. However, it is consensual in the rehabilitation process of the post-prostatectomy patient, offering treatments, based on the levels of evidence and recommendation grade, with the objective of improving the quality of life of the patient and whenever possible accelerate the recovery of continence and erectile function.

Author details

Mauro Luis Barbosa Junior[1*], Ericka Kirsthine Valentin[1] and Karoline Camargo Bragante[2]

1 Rio de Janeiro State University, Rio de Janeiro, Brazil

2 Federal University of Health Sciences of Porto Alegre, Porto Alegra, Brazil

*Address all correspondence to: maurolbarbosajr@gmail.com

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